

## **REMARKS**

Claims 50, 52-59, and 61-65 are pending in the subject application. In the Office Action, claims 50, 52-59, and 61-65 are rejected under 35 U.S.C. §103(a). More specifically, claims 50, 52-59, and 61-65 were rejected under 35 U.S.C. §103(a) as being unpatentable over U. S. Patent No. 5,700,518 issued to Lee et al. ("Lee") or United States Patent No. 5,674,620 issued to Puia et al. ("Puia") or United States Patent No. 5,415,674 issued to Feistritz ("Feistritz") or United States Patent No. 5,204,167 issued to Saijo et al. ("Saijo"), and under 35 U.S.C. § 103(a) as being unpatentable over U. S. Patent No. 5,380,408 issued to Svensson ("Svensson") (collectively, the "Cited References"). Applicants traverse these rejections and respectfully submit the following remarks and arguments to overcome the rejections.

### **Claim Rejections under 35 U.S.C. § 103(a)**

Claims 50, 52-59, and 61-65 are rejected under 35 U.S.C. § 103(a) as unpatentable over the Cited References.

The claims of the subject application are directed to an article, comprising a composite portion comprising hard constituent particles in a binder, an etched surface region substantially free of eta phase, the etched surface portion comprising substantially intact hard constituent particles and voids between the substantially intact hard constituent particles, wherein the voids extend to the composite portion, and a wear resistant coating on the etched surface region and disposed in the voids. The claim describes an article wherein the hard constituent particles of the etched surface portion are substantially similar to the hard constituent particles of the composite portion. However, binder material is not present between the substantially intact hard constituent particles of the etched surface portion to

create voids, with the voids extending into the composite portion and to a depth of between 3 microns and about 15 microns. The wear resistant coating is disposed on the etched surface region and in the voids. Typically, etching processes would etch both the binder and hard constituent particles thereby rendering the hard constituent particles not substantially intact or cause the formation of an eta phase. The cited prior art references, as individually discussed below, do not include the structure of the article as described in the limitations of independent claims 50 or 59, as amended or claims 52-58, and 61-65 dependent therefrom.

In the Office Action, the pending claims in the subject application are rejected based on Cited References which in the Examiner's opinion are unpatentable under 35 U.S.C. § 103 (a). Applicants submit that a *prima facie* case of obviousness under 35 U.S.C. §103(a) requires, among other things, that the cited references, when combined, teach or suggest every element of the claim. See MPEP §2142. Applicants submit that the Office has not established a *prima facie* case of obviousness because not all elements of claims 50 or 59 are taught or suggested by the Cited References. More specifically, Applicants submit that Cited References, either alone or in combination, fail to teach or suggest, among other things, an etched surface region substantially free of eta phase, the etched surface portion comprising substantially intact hard constituent particles and voids between the substantially intact hard constituent particles, wherein the voids extend to the composite portion, and a wear resistant coating on the etched surface region and disposed in the voids. Applicants respectfully submit that claimed article is patently distinct from the cited prior art since the articles do not disclosed each and every element as set forth in the claim. The Cited References may disclose a substrate and a coating, but the structures of the articles in the references are different than the claimed article. The articles disclosed

in the prior art comprise a different structure between the coating and the substrate than the article claimed in the subject application. Each structure takes a different approach to increasing the adherence of the coating to the substrate. Applicants herein discuss these structural differences. All citations refer to the prior art reference unless otherwise stated.

**U. S. Patent No. 5,700,518 issued to Lee et al.**

Lee discloses a method of producing a coated composite material substrate that comprises first etching of the hard constituent of the composite material by an electrolytic etching process or a liquid chemical etching. *See column 2, lines 45 - 59.* In a cemented carbide object, this method produces a substrate wherein the "carbide phase of the cemented carbide is irregularly etched". *See column 2, lines 62 - 66.* Subsequently, the substrate is further etched "resulting in the removal of the cobalt binder phase". *See column 3, lines 3 - 6.*

As set forth in the claims, the claimed article comprises unetched hard constituent particles (in certain embodiments, a carbide phase). The article described in Lee does not include a surface portion comprising unetched hard constituent particles, and therefore, does not include each and every element as set forth in the claim. In addition, Lee does not discuss the eta phase formation in the etched surface phase, therefore may comprise eta phase. Reconsideration of the rejection because Lee does not teach or suggest all of the limitations of the claimed invention is respectfully requested.

**U. S. Patent No. 5,674,620 issued to Puia et al.**

Puia discloses a process of diamond coating a cemented carbide tool wherein the surface binder has been passivated with added carbon by plasma treatment, or other form of carburization to reduce or eliminate its undesirable

reactivity with diamond or diamond growth species. The formation of eta phase is not discussed in the application and eta phase may be formed by certain methods of passivation of the surface region such as by plasma or by annealing in the presence of atomic hydrogen and a hydrocarbon source gas. The subject application discusses a mechanism by which eta phase may be formed in the presence of hydrogen such as described in Puia. Further, there is no suggestion or teaching to modify the articles of Puia for use with other coating other than diamond or for products wherein the carbide particles in the surface region remain substantially intact.

Further Puia, teaches away from the claimed article in the background. *See column 1, lines 43 to 55.* Puia states that removal of binder from between the carbide leaves at least a portion of the tungsten carbide grains without sufficient mechanical support to the remaining composite to provide a sound bond for diamond deposited on the surface. The present inventors have found that if all the limitations of the claimed product are met that this is not the case and sufficient mechanical support is provided. Reconsideration of the rejection because Puia does not teach or suggest all of the limitations of the claimed invention is respectfully requested.

**U. S. Patent No. 5,415,674 issued to Feistritzer et al.**

Feistritzer discloses a method of producing a coated composite material substrate that comprises creating at the substrate surface, via the presence of dissociated hydrogen, conditions resulting in the thermal evaporation of binder metal. This thermal evaporation of the binder material creates temperatures at the surface of the substrate of "about 3000°C. However, diffusion and phase changes in cemented materials can no longer be neglected from temperatures of 900° and above." *See column 4, lines 38-39.* The high temperature at the surface results in "recrystallizing, in addition to and simultaneously with the evaporation of binder metal, the hard

material remaining in the boundary zone whereby the substrate surface is restructured and roughened.” *See column 3, lines 18-21.*

The Feistritzer thermal process of evaporation had recrystallization results in a “closed, roughened hard material surface structure.” *See column 4, lines 25-26.* This surface structure is distinct from the surface structure of the claimed article. The claimed article comprises an etched surface portion comprising voids extending to the unetched region. The article of Feistritzer is a closed surface structure of hard material which does not comprise voids extending to the unetched portion and, therefore, does not include each and every element as set forth in the claim. In addition, the presence of disassociated hydrogen in the etching phase may result in eta phase of the surface region.

Reconsideration of the rejection because Feistritzer does not teach or suggest all of the limitations of the claimed invention is respectfully requested.

**U. S. Patent No. 5,204,167 issued to Saijo**

Saijo discloses an article comprising recrystallized tungsten carbide in a surface layer. The recrystallized tungsten carbide is not substantially intact hard constituent particles and therefore does teach or suggest the limitations of the present invention. Saijo specifically teaches that the carbide at the surface has different grains size that the carbide in the substrate. *See column 6, lines 9 to 18.* The disclosed process of Saijo specifically discusses graphite formation at the interface of the carbide and the binder. This problem is specific to processes that use a diamond coating. There is no suggestion or motivation to use this process for other coating techniques, such as an MT coating, which would not have the same problems to overcome.

In addition, the recrystallization step is designed to close any voids in the surface region that may extend to the unetched region. Similar to Feistritzer, this surface structure is distinct from the surface structure of the claimed article. The claimed article comprises an etched surface portion comprising voids extending to the unetched region. The article of Feistritzer and Saijo are closed surface structures of hard material which does not comprise voids extending to the unetched portion. Therefore, the structure of the surface region of an article of Saijo is different than the claimed article and none of the Cited References teach or suggest modification of the article to produce the claimed invention.

In addition, though not discussed, it is believed that the decarburization step of Saijo may lead to the formation of eta phase in the surface region.

**U. S. Patent No. 5,380,408 issued to Svensson**

Svensson discloses a method of producing a coated composite material substrate that has been processed so that the "cobalt layer on the surface will be effectively removed whereas the cobalt in the channels between the hard material grains will not be etched away. The binder phase layers between the carbide grains, which are necessary for the strength of the cemented carbide are not affected." *See column 2, lines 39-45.*

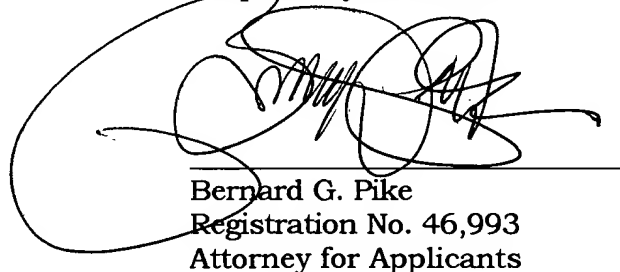
The method and resultant product of Svensson produces the opposite result and structure of the claimed article of the subject application. As discussed above, the claimed article of the subject application comprises an etched surface portion comprising voids between the unetched carbide particles. The product described in Svensson does not include these voids and actually teaches away from creating these voids. *See column 2, lines 43-45.* The claimed article comprises a protective coating disposed in the voids. Obviously, if the product of Svensson does

not include voids, a protective coating may not be disposed in the voids. The article described in Svensson does not include, teach, or suggest each and every element as set forth in the claim.

### CONCLUSION

For the reasons discussed above, none of the cited references describe each and every element of the article of claims 50, 52-58, and 60-65. Accordingly, withdrawal of the rejections under 35 U.S.C. § 103(a) for each reference and reconsideration of these claims, and consideration of the new claims, is respectfully requested. Furthermore, it is asserted that based on the clear distinctions between the claims of the subject application and the Cited References set forth above, no reference or combination of references cited by the Examiner suggests or teaches the claimed article. Accordingly, it is respectfully submitted that the claims of the subject application cannot be said to be rendered obvious by the teachings of the cited references in any combination. In view of the foregoing amendments, Applicants respectfully submit that the subject application is in condition for allowance.

Respectfully submitted,



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